Sample Paper – 2011
Class – XII
Subject - MATHEMATICS

Time Allowed : 3 hrs ***Max Marks : 100***

General Instructions :

The question paper consists of three sections A, B , C .Section

(i) For section A Questions number 1 to 10 are of 1marks each. .
(ii) For Section B Questions number 11 to 22 are of 4 marks each.
(iii) For Section C Questions number 23 to 29 are of 6 marks each.
(iv) All questions are compulsory.
(v) Internal choice have been provided in some questions. You have to attempt only one of the choices in such questions.
(vi) Use of calculator is not permitted. However, you may ask for logarithmic and &

statistical tables , if required.

SECTION - A

1). Show that the function f : N→N given by F(x) = 3x . Show that f is not an onto.

2). Find $\tan^{-1} [2 \cos(2 \sin^{-1} 1/2)]$.

3). For matrix $A = \begin{pmatrix} -3 & 6 & 0 \\ 4 & -5 & 8 \\ 0 & -7 & -2 \end{pmatrix}$, find $\frac{1}{2}(A - A^T)$ where A^T is the transpose of A.

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4). Find a matrix C such that A + B + C is a null matrix $A = \begin{pmatrix} 2 & 0 & 1 \\ 3 & -1 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \end{pmatrix}$

5). If $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} 1 & bc & a \\ 1 & ca & b \\ 1 & ab & c \end{vmatrix}$, then find the value of $\Delta_1 + \Delta_2$.

6). Using the properties of determinants prove that $\begin{vmatrix} x+4 & x & x \\ x & x+4 & x \\ x & x & x+4 \end{vmatrix} = 16\,(3x + 4)$.

7). Evaluate $\int x \sqrt{(x+2)}dx$

8) Given $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, find $|\vec{a} \times \vec{b}|$

9). If $f(x) = e^x \sin x$ in $[0, \pi]$, then find c in Rolle's theorem .where $0<c<\pi$

10). Find the projection of the vector $\hat{i} - \hat{j}$ and $\hat{i} + \hat{j}$.

SECTION - B

11). Let A= N x N and let * be a binary operation on A defined by
(a,b) * (c,d) = (ad+bc , bd) for all (a,b) , (c,d) Є N x N
Show that * is both commutative and Associative in A .
Also find identity elements in A if any.

$\begin{cases} 3ax + b, & \text{for } x > 1 \end{cases}$

12). If the function $f(x) = \begin{cases} 11, & \text{for } x = 1 \\ 5ax - 2b, & \text{for } x < 1 \end{cases}$ is continuous at $x = 1$, find the values of a and b .

13. Evaluate : $\displaystyle\int_{\pi/6}^{\pi/3} \frac{(\text{Sin}x + \cos x)}{\sqrt{\text{Sin}2x}}\, dx.$

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14). Evaluate : $\displaystyle\int \frac{(x^2+4)\ \ dx}{x^4 + x^2 + 16}$

OR

$\displaystyle\int_0^1 \text{Cot}^{-1}(1 - x - x^2)\,dx$

15). Prove that : $\displaystyle\int_0^{\pi/2} \frac{\sin^2 x}{\sin x + \cos x}\,dx = \frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$

16.) Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs . Find the probability that there is alteast one defective eggs.

OR

A football match may be either won , drawn or lost by the host country 's team . So there are three ways of forecasting the result of any one match , one correct and two incorrect . Find the probability of forecasting atleast three correct results for four matches.

17). Prove that $9\pi/8 - 9/4 \sin^{-1}.1/3 = 9/4 \sin^{-1} (2\sqrt{2})/3$

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18). [illegible] $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ [illegible]

19) Find the image of the point (1,6,3) in the line x/1 = (y-1)/2 = (z-2)/3

20) The two equal sides of an isosceles triangle with fixed base b are decreasing at the rate of 3 cm/sec. How fast is the area decreasing when the two equal sides are equal to the base ?

21) Solve the differential equation : $(1+ y^2)\, dx = (\tan^{-1}y - x)\, dy$; given y (0) = 0

22) If $\hat{a}$ and $\hat{b}$ are two unit vectors and θ is the angle between them , then show that $\sin\theta/2 = \frac{1}{2} \,/\, \vec{a} - \vec{b} \,/$

SECTION – C

23). Given that $A = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ find AB. Hence using this product.:

solve the system of equations

x – y + z = 4, x – 2y – 2z = 9, 2x + y + 3z = 1

OR

Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ by using elementary row transformations.

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24). Using the method of integration, find the area of the smaller region bounded by ellipse :
$x^2/16 + y^2/9 = 1$ and line $x/4 + y/3 = 1$

25) Show that the height of a cylinder, which is open at the top, having a given surface and greatest volume, is equal to the radius of its base .

26) Suppose that the reliability of a HIV test is specified as follows :
Of the people having HIV , 90% of the test detect the disease but 10 % go undetected. Of the people free of HIV , 99% of the test are judged HIV negative but 1% are diagnosed as showing HIV positive . From a large population of which only 0.1% have HIV , one person is selected at random , given the HIV test , and the pathologist reports him/ her as HIV positive . What is the probability that the person actually has HIV ?

27) Find the equation of the plane passing through the point (-1,-1, 2) and perpendicular to each of the following planes : $2x + 3y - 3z = 2$ and $5x - 4y + z = 6$

28) An aeroplane can carry a maximum of 200 passengers. A profit of Rs 400 is made on each first class ticket and a profit of Rs 300 on each second class ticket. The air lines reserves at least 20 seats for first class. However, at least four times as many passengers prefer to travel in second class than by the first class ticket. Determine how many tickets of each class must be sold to maximize profit for airlines. What is the maximum profit?
Solve it as Graphically ?

29. Evaluate $\int_{0} x\,(\tan^{-1}x)^2\,dx$
